

## CLAIMS

1. A leak detection system for a vehicle, comprising:  
a fuel system; and  
a controller that communicates with said fuel system, that  
detects a fuel filling event, that initiates a vapor leak test of said fuel  
5 system, and that terminates said vapor leak test if a fuel filling event is  
detected.
2. The leak detection system of claim 1 further comprising a  
vent valve that seals said fuel system, wherein said controller closes  
said vent valve after initiating said vapor leak test.
3. The leak detection system of claim 1 wherein said  
controller monitors vapor pressure within said fuel system to detect  
said fuel filling event.
4. The leak detection system of claim 1 wherein said  
controller monitors a fuel level in a fuel tank of said fuel system to  
detect said fuel filling event.
5. The leak detection system of claim 1 wherein said  
controller monitors a fuel level within a fuel tank of said fuel system  
after terminating said vapor leak test to confirm that said fuel filling  
event occurred.

6. A method of testing vacuum of a fuel system, comprising:  
initiating a vapor leak test;  
generating a vapor pressure signal for said fuel system; and  
terminating said vapor leak test if a difference between said
- 5 vapor pressure signal and a reference vapor pressure signal is greater  
than a threshold value.
  7. The method of claim 6 further comprising sealing said  
fuel system.
  8. The method of claim 7 further comprising unsealing said  
fuel system if said vapor leak test is terminated.
  9. The method of claim 6 further comprising updating said  
reference vapor pressure signal.
  10. The method of claim 9 wherein said step of updating  
includes setting said reference vapor pressure signal equal to a  
previous vapor pressure signal.
  11. The method of claim 6 further comprising filtering said  
vapor pressure signal.
  12. The method of claim 6 further comprising ending said  
vapor leak test after a predetermined time period.
  13. The method of claim 6 further comprising:  
monitoring a fuel level within a fuel tank of said fuel system; and  
terminating said vapor leak test if said fuel level increases a  
predetermined level.

14. The method of claim 13 wherein said monitoring said fuel level includes:

setting an initial fuel level equal to a reference fuel level upon initiating said vapor leak test; and

- 5 indicating a fuel level increase if a difference between a present fuel level and said reference fuel level is greater than said predetermined level.

15. The method of claim 6 further comprising:

monitoring a fuel level within said fuel system if said vapor leak test is terminated; and

confirming said termination if said fuel level increases.

16. A method of testing vacuum of a fuel system, comprising: detecting a key-off event;

initiating a vapor leak test if a pre-condition is present;

generating a current vapor pressure signal for said fuel system;

- 5 monitoring a fuel level of a fuel tank of said fuel system; and terminating said vapor leak test if at least one of said present vapor pressure signal and said fuel level indicates a fuel filling event.

17. The method of claim 16 further comprising sealing said fuel system.

18. The method of claim 17 further comprising unsealing said fuel system if said vapor leak test is terminated.

19. The method of claim 16 wherein said vapor leak test is terminated if a difference between said current vapor pressure signal and a reference vapor pressure signal is greater than a threshold value

20. The method of claim 19 further comprising updating said reference vapor pressure signal.

21. The method of claim 20 wherein said updating comprises setting said reference vapor pressure signal equal to a previous vapor pressure signal.

22. The method of claim 19 further comprising filtering said current vapor pressure signal.

23. The method of claim 16 further comprising ending said vapor leak test after a predetermined time period.

24. The method of claim 16 wherein said monitoring a fuel level comprises:

setting an initial fuel level equal to a reference fuel level upon initiating said vapor leak test; and

5 indicating a fuel level increase if a difference between a present fuel level and said reference fuel level is greater than said predetermined amount.

25. The method of claim 16 further comprising:  
monitoring said fuel level within said fuel system if said vapor leak test is terminated; and  
confirming said termination if said fuel level increases.

26. A method of detecting a fuel filling event of a fuel system, comprising:

- generating a vapor pressure signal for said fuel system;
- monitoring a fuel level of a fuel tank of said fuel system; and
- 5 signaling said fuel filling event if at least one of said vapor pressure signal and said fuel level indicates a fuel filling event.

27. The method of claim 26, further comprising:

- setting an initial fuel level equal to a reference fuel level; and
- indicating a fuel level increase if a difference between said fuel level and said reference fuel level is greater than a predetermined
- 5 amount.

28. The method of claim 26, further comprising:

- updating a reference vapor pressure signal; and
- indicating a fuel level increase if a difference between said vapor pressure signal and said reference vapor pressure signal is greater
- 5 than a predetermined amount.

29. The method of claim 26, further comprising:

- monitoring said fuel level within said fuel system if said fuel filling event is detected; and
- confirming an occurrence of said fuel filling event if said fuel
- 5 level increases.